



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Difficult horses – Prevalence, approaches to management of and understanding of how they develop by equine veterinarians

Citation for published version:

Pearson, G, Reardon, R, Keen, J & Waran, N 2020, 'Difficult horses – Prevalence, approaches to management of and understanding of how they develop by equine veterinarians', *Equine Veterinary Education*. <https://doi.org/10.1111/eve.13354>

Digital Object Identifier (DOI):

[10.1111/eve.13354](https://doi.org/10.1111/eve.13354)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Equine Veterinary Education

Publisher Rights Statement:

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.



Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.



Original Article

Difficult horses – prevalence, approaches to management of and understanding of how they develop by equine veterinarians

G. Pearson^{†*} , R. Reardon[†], J. Keen[†]  and N. Waran^{‡§}[†]Equine Hospital, Royal (Dick) School of Veterinary Studies, University of Edinburgh; [‡]Jeanne Marchig International Centre for Animal Welfare, Royal (Dick) School of Veterinary Studies, University of Edinburgh, Midlothian, UK; and[§]Faculty of Education, Humanities and Health Science, Eastern Institute of Technology, Taradale, New Zealand

*Corresponding author email: gemma.pearson@ed.ac.uk

Keywords: horse; veterinarian; injury; learning theory; behaviour

Summary

Despite the considerable risk of veterinary occupational injury due to adverse horse behaviour, limited information is available about the prevalence of unwanted equine behaviours or common approaches to managing them. An understanding of learning theory may affect veterinarians' approaches to dealing with unwanted equine behaviours; however, learning theory is not widely taught. The aim of this study was to document the challenges equine veterinarians face when working with difficult horses and define their approaches to managing them, including their understanding of the processes through which horses learn. A link to an online survey was distributed via email amongst UK equine veterinarians. Descriptive and Kruskal–Wallis statistical analyses were performed. We found that 95% of equine veterinarians reported working with difficult horses on at least a monthly basis, resulting in 81% of them sustaining at least one injury in the last 5 years. The most popular methods of dealing with unwanted behaviours were physical and chemical restraint. 46% of those surveyed had never received any tuition on the processes through which horses learn. Despite 79% believing they had at least a moderate understanding of equine learning theory, they performed poorly when tested, with only 10% able to get at least five out of six questions correct. Further education on the subject of learning theory may be beneficial.

Introduction

Working as an equine veterinarian has been shown to carry a high risk of occupational injury, with horse behaviour being a well-recognised risk factor (Reijula *et al.* 2003; Jäggen *et al.* 2005; Nienhaus *et al.* 2005; Fritsch *et al.* 2006; Hout and Mills, 2006; MacLeay 2007; Parkin *et al.* 2018). To the authors' knowledge, there have been no previous studies investigating the prevalence of unwanted equine behaviours that veterinarians currently experience, or their approaches to managing these unwanted behaviours. It was hypothesised that equine veterinarians would frequently encounter horses aversive to various aspects of veterinary care and that many horses exhibit potentially dangerous behaviours such as kicking with a hind leg, barging, rearing or striking with a foreleg.

Formal training on the subject of equine behaviour and specifically the processes through which horses learn new behaviours (learning theory) remains limited. Current literature

on undergraduate veterinary training suggests the emphasis remains on physical restraint when faced with a difficult horse (Austin *et al.* 2007; Cawdell-Smith *et al.* 2007; Chapman *et al.* 2007; Hanlon *et al.* 2007; Stafford and Erceg, 2007), and so it was hypothesised that veterinarians would be reliant on chemical and physical restraint to mitigate against the potential adverse effects of these equine behaviours. Developing a greater understanding of the most common types of unwanted behaviours seen, the popular methods of dealing with these and the current level of understanding of learning theory by equine veterinarians have the potential to highlight areas where further education or research may help reduce the risk of occupational injury.

Materials and methods

Questionnaire

A questionnaire was drafted using web-based proprietary software¹ and piloted amongst equine veterinarians at the authors' institution. Responses and comments about the questionnaire from 13 staff were used to make adjustments to the questionnaire. The final questionnaire (**Supplementary Item 1**) consisted of 26 questions, the majority with closed options (e.g. scale and multiple choice) and the others with open ended (free text comments). All data were anonymised.

The questionnaire was distributed via an electronic survey invitation included as a link in two editions of the British Equine Veterinary Association (BEVA) e-Newsletter and also included in an email sent to referring practices of the authors' institution. A second, reminder email, was sent out one month later. Approximately 1700 veterinarians received the BEVA eNews and/or direct email (Brown *et al.* 2014). Aside from question 12 (which related to the consequences of any injuries sustained, so did not apply to respondents who had not sustained an injury), all closed ending questions were compulsory. Only fully completed questionnaires were included in the results.

The questionnaire was divided into five sections:

- 1 Demographics of respondents (questions 1–7).
- 2 Prevalence of difficult horses and unwanted equine behaviours (questions 8–10).
- 3 Number of injuries sustained from horses within the last 5 years, the consequences of these injuries and how frequently they perceived they were in a dangerous situation when working with horses (questions 11–13).

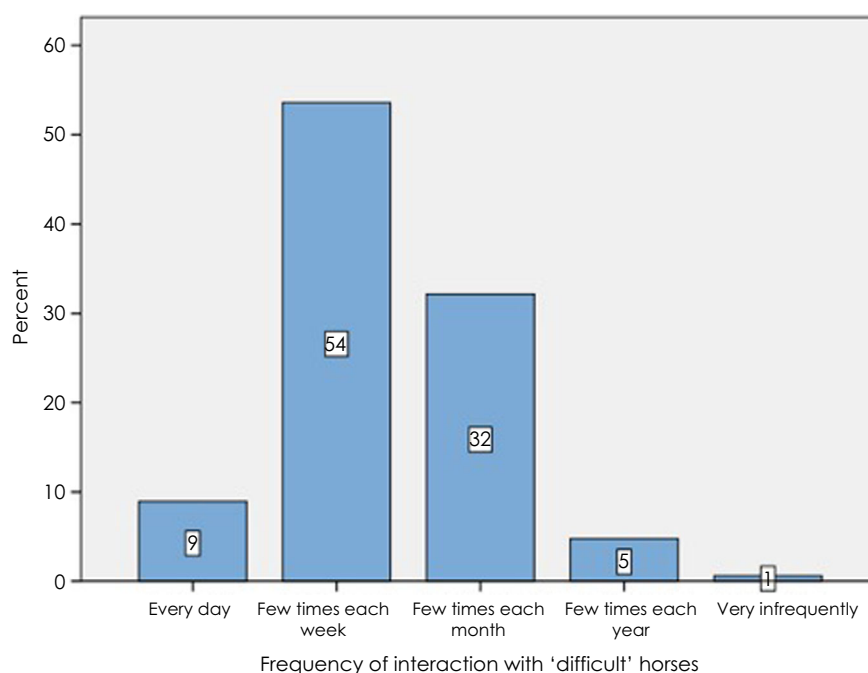


Fig 1: Box plots showing the frequency of interaction with horses that the veterinarian perceived as difficult (percentage shown in box).



Individual standard deviations were used to calculate the intervals.

Fig 2: Interval plot showing the percentage of horses treated that were considered 'difficult' subdivided by number of years spent working as an equine veterinarian. The dots represent the mean, and error bars represent 95% lower and upper confidence intervals of the mean.

- 4 Value placed on different specified methods of controlling difficult horses (questions 14–15).
- 5 Knowledge of learning theory:

- a How much teaching they had received, how well they understood how horses learn and how effectively they could apply this knowledge (questions 16–18).
- b Understanding of specific terms relating to learning theory: Respondent's perceived understanding of specific terms, for example negative reinforcement (yes, no) and

respondent's actual understanding tested by their ability to select the correct description of specific terms.

Statistical analyses

To investigate whether the number of years working as an equine veterinarian was related to the number of difficult horses/number of specific unwanted behaviours (such as needle shy horses), veterinarians encountered, the frequency

of these scenarios were defined. The number of horses seen per month was converted from an ordered category (from the survey) into a single numerical value (a), estimated as the middle of the group, see **Supplementary Item 2**. The frequency of experiencing an unwanted behaviour was also converted from an ordered category into a single numerical value (b) as shown in **Supplementary Item 2**, attempting to take into account how frequently these scenarios were encountered per month, based on 20 working days per month. A percentage value was then calculated as the number of times an unwanted behaviour was encountered divided by the number of horses veterinarians treated each month multiplied by 100 ($b/a \times 100$). Frequencies of encountering unwanted behaviours were tested for normality using Ryan Joiner tests and were not significantly different to normal and so were compared between 'years working with horses' groups using Kruskal–Wallis tests (Minitab²), and $P < 0.05$ was considered significant.

Descriptive statistical analyses of the remaining data were undertaken using IBM SPSS³.

Results

Demographics

Of 220 completed questionnaires, 28 (12%) were excluded as the veterinarians reported they were based outside of the UK. A further 27 questionnaires (12%) were excluded as they reported routinely treating 20 or fewer horses each month, which made comparisons of frequency data for these respondents unreliable. This left 168 respondents that were included in the final analyses.

The majority of respondents (73%, $n = 123$) reported spending 100% of their time working with horses, with 79% ($n = 132$) seeing more than 50 horses each month.

Frequency of difficult horses and unwanted behaviours

Ninety-five per cent of veterinarians reported interacting with horses that they perceived to be difficult at least a few times each month (**Fig 1**). Although there appeared to be a relationship between increasing veterinary experience and decreasing frequency of dealing with 'difficult horses' as well as decreased variance (**Fig 2**), this was not statistically significant ($P = 0.11$).

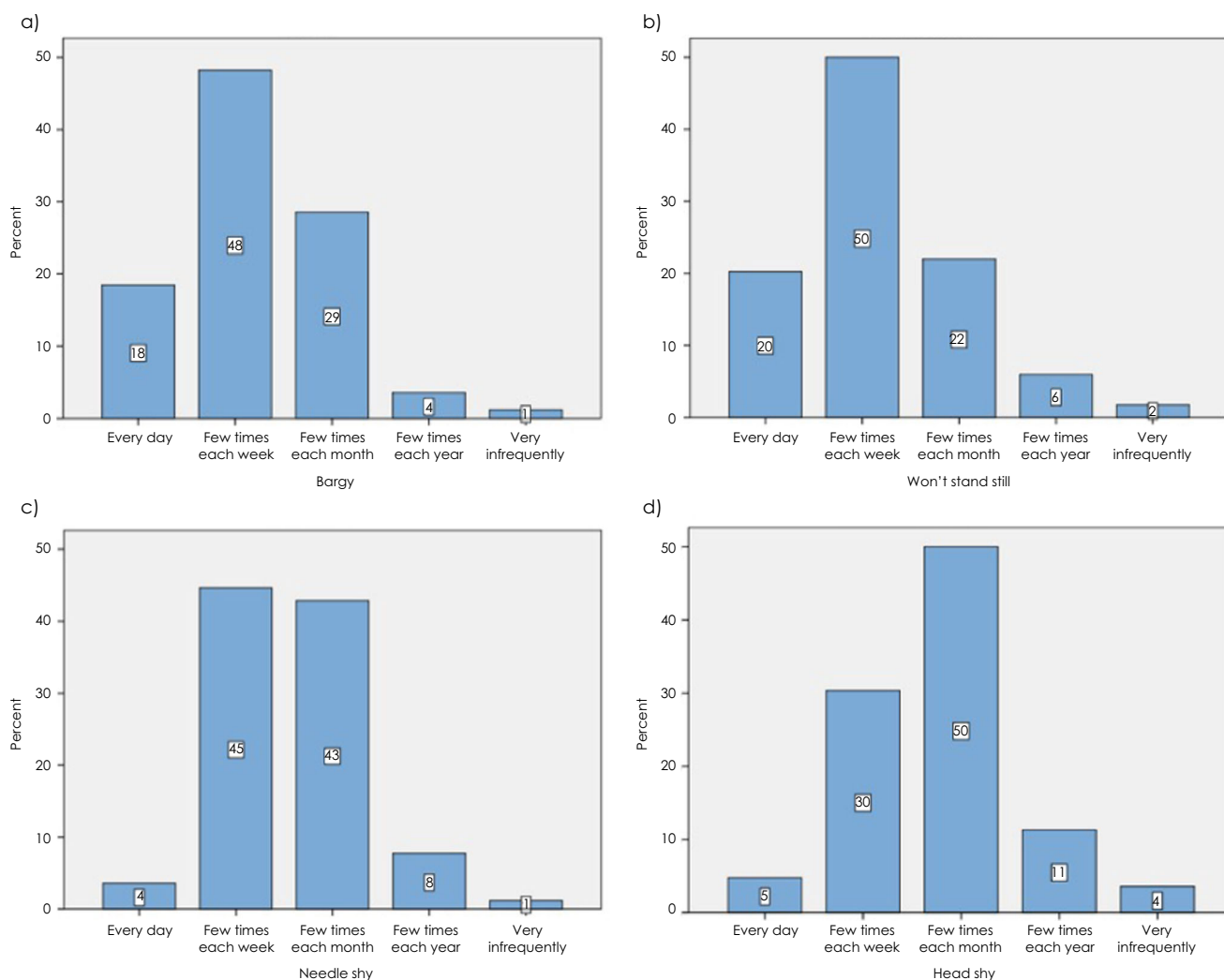


Fig 3: Box plots showing the most common unwanted behaviours equine veterinarians encountered (percentage shown in box).

TABLE 1: The frequency of unwanted behaviours encountered and association between reduced prevalence with experience

Unwanted behaviour	Percentage (%) of veterinarians encountering the behaviour on at least a monthly basis	Association between decreased frequency of unwanted behaviour and increased years working in equine practice
Bargy/Pushy	95	P = 0.002
Won't stand still	92	P = 0.002
Needle shy	92	P = 0.005
Head shy	85	P = 0.009
Clipper shy	84	P = 0.138
Kick with a hind foot	67	P = 0.019
Pull away	58	P = 0.051
Refusing to load	55	P = 0.335
Strike with a fore foot	50	P < 0.001
Rearing	49	P = 0.007
Refuse to enter stocks	49	P = 0.407
Refuse to be caught (stable or field)	49	P = 0.279
Bite	41	P < 0.001
Refuse to enter examination room	41	P = 0.205

Values in bold indicate significant results.

The most common unwanted behaviours were horses that were bargy/pushy, would not stand still, were needle shy or head shy (**Fig 3**), all of which were encountered significantly less frequently with increasing years working in equine practice (**Table 1** and **Fig 4**). Other unwanted behaviours encountered included head butting/striking with head (8 respondents, 5%), crushing people against walls (7 respondents, 4%), refusing to lift feet (4 respondents, 2%), resenting palpation/handling of feet/limbs (2 respondents, 1%) and refusing endoscopy (2 respondents, 1%).

Injury rates

Eighty-one per cent of respondents (n = 136) had sustained at least one injury, caused by a horse that they were treating or examining, in the previous 5 years. In total, 579 injuries were reported in the previous 5 years, with one further respondent reporting more than 30 injuries in the past 5 years. Of these injuries, 88 (15%) required a visit to hospital, 61 (11%) required a visit to their general practitioner, 92 (16%) required days off work and 215 injuries (37%) resulted in continued discomfort or loss of function.

Frequency of dangerous working situations

A cumulative frequency of 92% of respondents reported that they put themselves in a potentially dangerous situation when working with horses on at least a monthly basis (**Fig 5**).

Methods of restraint or control of difficult horses

The most popular method of restraint was chemical sedation with 99% of respondents considering it either very or fairly useful, for full results see **Table 2**. Further free text responses reported physical restraint with 20 respondents (12%) suggested an ear twitch and six suggested use of a lip chain/stabiliser. Use of stocks or a crush was suggested by 13 respondents (8%) with a further 8 (5%) suggesting other methods of confining the horse such as in a stable or trailer. Blindfolding was suggested by 7 respondents (4%). Help by a competent person was suggested by 12 respondents (7%). Many other single responses are not described but are available in **Supplementary item 1**.

Perceived understanding of learning theory

Forty-six per cent of respondents (n = 65) reported that they had received no tuition on the subject of learning theory, and yet 78% of respondents (n = 131) reported that they understood how horses learn and were able to apply this knowledge either moderately, well or very well (**Fig 6**).

Perceived understanding of learning theory terminology

With regard to operant conditioning, a high percentage of respondents thought they understood the term positive reinforcement, 84% (n = 118), and negative reinforcement, 80% (n = 113). The respondents were less confident when asked about punishment with only 38% (n = 54) (positive punishment) and 47% (n = 66) (negative punishment) saying they understood the terms. The majority of respondents, 79% (n = 111), also reported understanding the term habituation, but were less confident about the term classical conditioning 57% (n = 81).

Actual understanding of learning theory terminology

When tested, of the 84% (n = 141) who stated that they did understand the term positive reinforcement, only 19% (n = 22) were able to correctly identify the scenario as incorrect. Of the 80% (n = 134) who had stated they correctly understood the term negative reinforcement, only 33% (n = 37) were correct. Whilst far fewer respondents had originally stated they understood the terms positive punishment (38%, n = 64) and negative punishment (47%, n = 79), those respondents still only correctly identified the scenarios in 43% (n = 23) and 67% (n = 44) cases, respectively. Better results were seen for the terms habituation (97% [n = 129] of the 79% [n = 132], who thought they understood the term) and classical conditioning (91% [n = 87] of the 57% [n = 96] who thought they understood the term), as shown in **Table 3**.

Discussion

The cause of the low response rate of 13% (of approximately 1700 members) is unknown, but is not dissimilar from another BEVA survey (Parkin *et al.* 2018) which received 318 responses to three emails in comparison with our 220 responses from two emails. Whilst equine veterinarians with differing levels of experience from across the UK were included, whether the 168 respondents are representative of the estimated 1900 equine vets (Mayes 2015) in the UK is unknown. It is likely that some selection bias occurred; the title of the link was 'difficult horse survey' so veterinarians that held opinions on horses

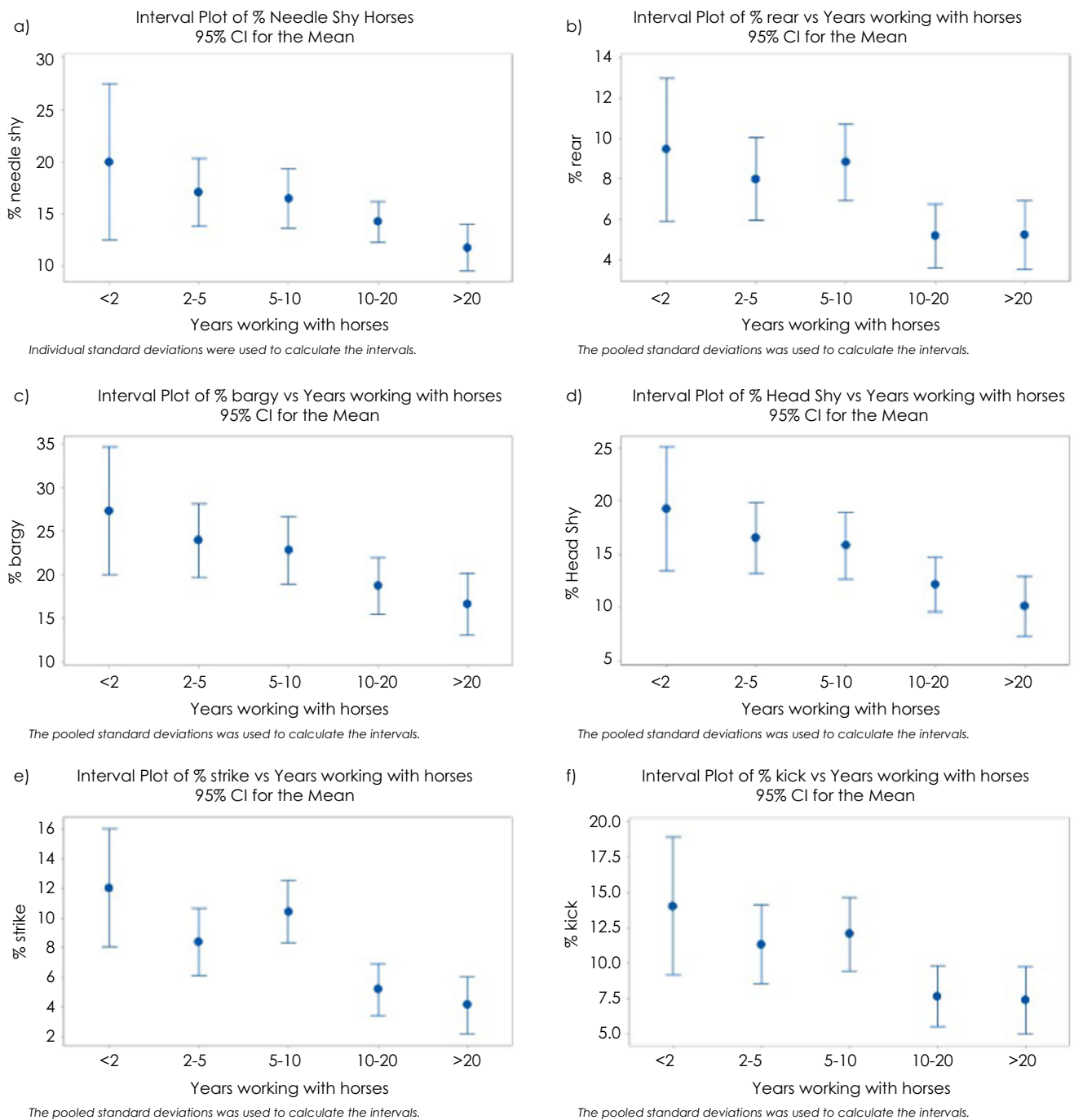


Fig 4: Interval plot graphs demonstrating the effect of years working as an equine veterinarian on the percentage of cases seen demonstrating various unwanted behaviours. The dots represent the mean, and error bars represent 95% lower and upper confidence intervals of the mean. All results were significant ($P < 0.05$).

they perceived as difficult and those that had sustained an injury may have been more likely to participate. Scotland was over-represented with 41 respondents (24%); this would be expected considering the majority of the authors' institution referral practices emailed were based in Scotland. The rest of the responses for UK distribution, gender, nature of practice and years working in equine practice were similar to those described in other studies (Parkin *et al.* 2018) The survey was distributed in winter 2014 and so may not fully reflect the

current situation amongst UK veterinarians, although this time delay between collection of data and publication is similar to other publications such as Parkin *et al.* (2018)

'Difficult horses' were seen at least monthly by 95% of respondents. Whilst the definition of a 'difficult horse' likely varied slightly between respondents, this gives an overview of how commonly veterinarians experience challenging equine patients. The subsequent definitions provide more details of specific unwanted behaviours.

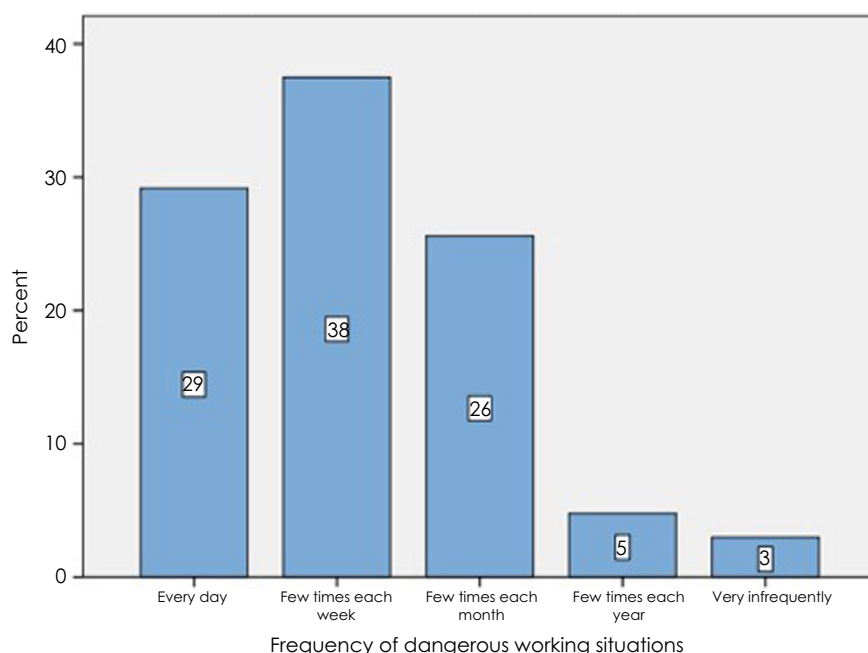


Fig 5: Box plot showing the prevalence of situations equine veterinarians perceived as potentially dangerous.

TABLE 2: Value placed on methods of restraint for control of difficult horses

Method of restraint	Percentage (%) of veterinarians considered the method			
	Very or fairly useful	Useful	Unhelpful, very unhelpful or useless	Don't understand or have not heard of technique
Sedation	99	1	0	0
Nose twitch	74	23	3	0
Neck twitch	69	24	7	0
Chifney bit	57	40	3	0
Bridle	49	46	5	0
Holding up a foreleg	47	42	11	0
Food distraction	39	46	15	0
Positive reinforcement	20	41	8	11
Remote injection	18	39	33	10
Lunge line	14	51	33	2
Overshadowing	8	9	16	67
Negative reinforcement	7	31	50	11

The two most commonly encountered unwanted behaviours (bargy/pushy and refusing to stand still) were indicative of poor stimulus control. A horse is described to be under stimulus control when they consistently respond to a cue or stimulus from the handler and are not influenced by the environment (McGreevy 2010). Further education and training of horse owners and handlers to be able to achieve

stimulus control may be useful for reducing these most common unwanted behaviours.

Aversions to specific stimuli (injections, handling of their head and clippers) were the next most common unwanted behaviours. Many of these stimuli are veterinary context specific, suggesting that further training in methodology to treat horses with aversions safely and effectively might be beneficial for veterinarians.

The prevalence of behaviours that have the potential to cause human injury (kicking with a hind foot, striking with a front foot, rearing or biting) was high, providing further insight into the rate of occupational injuries in the profession. It is also consistent with findings in other studies (Lucas *et al.* 2009; Brown *et al.* 2014; Parkin *et al.* 2018) where the most common causes of injuries were a result of a kick from a hindlimb, strike with a forelimb and crush injuries.

The association between increasing veterinary experience and decreasing adverse behaviours may suggest that veterinarians have a direct influence on the horse's behaviour. It is also consistent with other work demonstrating that veterinarians sustained fewer injuries per year with increasing experience (Parkin *et al.* 2018). Despite more recent graduates making up the smallest groups (<2 years = 6%, 2–5 years = 16%) of veterinarians included; they had much wider variation in their responses to the prevalence of various unwanted behaviours, when compared to the most experienced graduates who made up the largest groups (10–20 years = 30%, >20 years = 25%). This might reflect greater variation in the handling skills of recent graduates and that veterinarians adapt their techniques over time. Alternatively, it is also possible that veterinarians encountering many unwanted and potentially dangerous behaviours leave the equine sector.

The unwanted behaviours that were not significantly influenced by the number of years' experience included

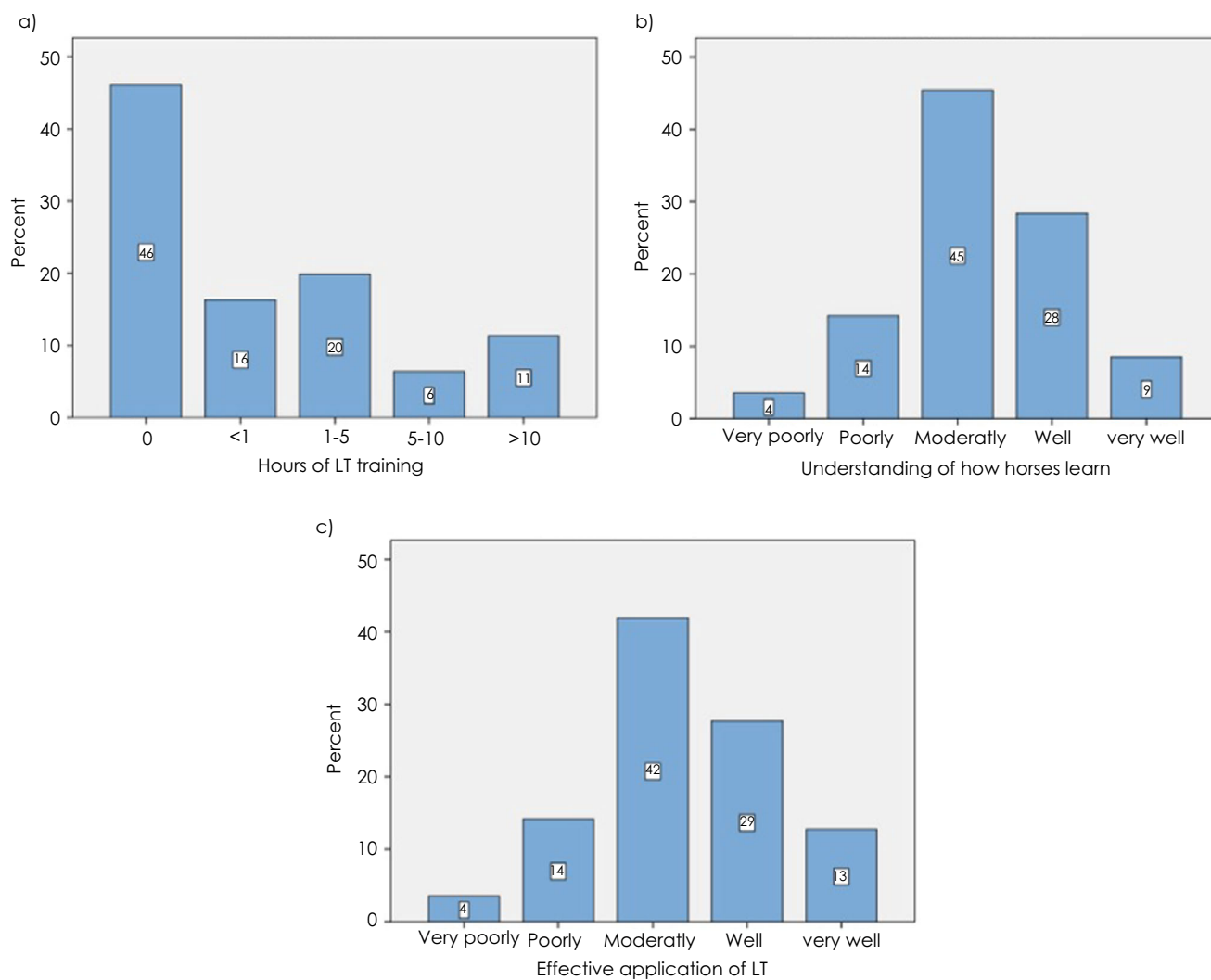


Fig 6: Box plots showing the reported hours of tuition respondents had received on the subject of learning theory, their perceived knowledge of understanding of how horses learn and ability to apply it.

TABLE 3: A summary of the responses given by participants who had previously stated they understood terminology related to learning theory

Terminology	Number who reported understanding the term	Response to scenario by those who reported understanding the term		
		Number who chose the correct answer	Number who chose the incorrect answer	Number who stated they did not know the answer
Positive reinforcement	6 (5%)	118 (84%)	22 (19%)	90 (76%)
Negative reinforcement	4 (3%)	113 (80%)	37 (33%)	72 (64%)
Positive punishment	54 (38%)	23 (43%)	25 (46%)	6 (11%)
Negative punishment	66 (47%)	44 (67%)	13 (20%)	9 (13%)
Habituation	111 (79%)	108 (97%)	0 (0%)	3 (3%)
Classical conditioning	81 (57%)	74 (91%)	2 (3%)	5 (7%)

those which had a reduced frequency generally, so may be related to lack of power of the study and those which might be expected to be more established in other situations outside of the veterinary environment; for example refusing to load into trailers.

Overall, 81% of respondents reported 579 injuries sustained due to the horse they were working with and 37% of these resulting in continued discomfort or loss of function, demonstrating repeatability as Parkin *et al.* (2018) found 80% of 620 UK veterinarians were injured by a horse. These figures continue to be concerning and do not suggest any reduction in the risk of occupational injury, despite previous studies highlighting the problem and suggesting action taken to improve these figures should be prioritised. Whilst variation in survey design prevents direct comparison, Landercasper *et al.* (1988) found 65% of 995 American veterinarians had sustained a major animal-related injury, with 17% or respondents being hospitalised in the previous year in 1988 and in 2006 (Fritschi *et al.* 2006) found 65% of large animal veterinarians had sustained an injury during their career that required hospital admission or significantly affected their work. Whilst these studies did not specifically look at injuries induced by horses, 71% of all accidents to veterinarians were associated with horses in the Netherlands in 2003 (Stembert *et al.* 2003).

Heath (2004) reported that equine veterinarians acknowledge the risk of occupational injury. This is supported by this survey where 29% of respondents stated that they put themselves in a potentially dangerous situation every day and a concerning 92% of respondents who acknowledge that they put themselves in a potentially dangerous situation, when working with a horse, on at least a monthly basis.

Currently equine veterinarians rely on chemical and physical restraint to allow them to complete their work when dealing with difficult horses; given the high prevalence of injuries, it is possible that these methods are not the most effective. As flight animals, horses prefer to withdraw from a situation they find aversive. If restraint prevents retreat, however, they are more likely to act aggressively instead with these behaviours being shaped into more dangerous responses surprisingly quickly (Lucas *et al.* 2009; Brown *et al.* 2014). Education of equine veterinarians, particularly with regard to management of difficult horses, may help to reduce these dangerous scenarios, as has been previously suggested (Doherty *et al.* 2017). Considering this, it is therefore disappointing that respondents reported having received limited training on the processes through which horses learn.

Despite many respondents reporting that they had a reasonable knowledge of how horses learn and with the ability to apply this knowledge, the respondents demonstrated a poor understanding of learning theory terminology. A similar lack of understanding in larger studies of horse trainers based in Australia and Canada (Warren-Smith and McGreevy, 2008; Wentworth-Stanley 2013) has been reported, suggesting a possible gap of knowledge across the equine industry. It is possible that equine veterinarians understand the processes through which horses learn without understanding the terminology. Although when asked how highly they rated various methods of dealing with unwanted behaviours, the respondents rated methods based on learning theory very poorly. Whilst this may simply

represent a lack of understanding of the terminology, the preference for physical restraint was emphasised in the free comments section, where there were no descriptions of techniques based on learning theory; this suggests there is a genuine lack of understanding. It is possible that increased training of equine veterinarians in the field of equine learning theory may reduce the high prevalence of occupational injuries caused by a horse's behaviour. Indeed, a 45-minute lecture on learning theory, and its application in the veterinary environment, was found to increase undergraduate students perceived confidence when confronted with a difficult horse. Even more encouragingly several students reported being able to successfully apply this new knowledge to difficult horses they encountered whilst on rotations, with many reporting they felt safer and less likely to become injured (Pearson 2017). Incorporation of education of learning theory into the undergraduate curriculum and as postgraduate training is indicated.

Authors' declaration of interests

No conflicts of interest are declared.

Ethical animal research

This study was approved by the Human Ethical Review Committee (HERC), The Royal (Dick) School of Veterinary Studies, HERC_509_20.

Source of funding

None.

Antimicrobial stewardship policy

This study did not involve or discuss any antimicrobials.

Acknowledgements

The authors are grateful to the BEVA for helping to promote this study and to all the veterinarians who kindly gave their time to complete the survey.

Authorship

G. Pearson designed and executed the study, analysed and interpreted the data and prepared the manuscript. R. Reardon assisted with study design as well as analysis and interpretation of the data. J. Keen and N. Waran assisted with study design. All authors gave their final approval of the manuscript.

Manufacturers' addresses

¹Bristol Online Survey, Bristol, UK.

²Minitab 17 Statistical Software, Pennsylvania, USA.

³IBM SPSS Statistics 21, IBM, Online

References

- Austin, H.E., Hyams, J.H. and Abbott, K.A. (2007) Training in animal handling for veterinary students at Charles Sturt University, Australia. *J. Vet. Med. Educ.* **34**, 566.

- Brown, J., MacDonald, E., Parkin, T. and Fisher, R. (2014) Work Related Injuries in Equine Practitioners, GROUP, H. W. L., University of Glasgow.
- Cawdell-Smith, A.J., Tribe, A., Pym, R.A.E., Verrall, R.G., Hohenhaus, M.A., Coleman, G.T. and Bryden, W.L. (2007) Animal handling as an integrated component of animal and veterinary science programs at the University of Queensland. *J. Vet. Med. Educ.* **34**, 542–549.
- Chapman, H.M., Taylor, E.G., Buddle, J.R. and Murphy, D.J. (2007) Student training in large-animal handling at the school of veterinary and biomedical sciences, Murdoch University, Australia. *J. Vet. Med. Educ.* **34**, 576–582.
- Doherty, O., McGreevy, P.D. and Pearson, G. (2017) The importance of learning theory and equitation science to the veterinarian. *Appl. Anim. Behav. Sci.* **190**, 111–122.
- Fritschi, L., Day, L., Shirangi, A., Robertson, I., Lucas, M. and Vizard, A. (2006) Injury in Australian veterinarians. *Occup. Med.* **56**, 199–203.
- Hanlon, A., Gath, V. and Mulligan, F. (2007) Practical animal-handling classes at University College Dublin. *J. Vet. Med. Educ.* **34**, 561–565.
- Heath, T. (2004) Australian veterinarians who work with horses: attitudes to work and career. *Aust. Vet. J.* **82**, 404–408.
- Haupt, K.A. and Mills, D.S. (2006) Why horse behaviour is important to the equine clinician. *Equine Vet. J.* **38**, 386–387.
- Jäggen, S., Fürst, A., Hässig, M. and Auer, J. (2005) Kick Injuries of Veterinarians during examination and treatment of horses: a retrospective study in Switzerland. *Schweiz. Arch. Tierheilkd.* **147**, 289–295.
- Landercasper, H.J., Cogbill, J.T., Strutt, O.P. and Landercasper, O.B. (1988) Trauma and the veterinarian. *J. Trauma Injury Infect. Crit. Care* **28**, 1255–1259.
- Lucas, M., Day, L. and Fritschi, L. (2009) Injuries to Australian veterinarians working with horses. *Vet. Rec.* **164**, 207.
- Macleay, J.M. (2007) Large-animal handling at the Colorado State University College of Veterinary Medicine. *J. Vet. Med. Educ.* **34**, 550–553.
- Mayes, B. (2015) Changes affecting the equine sector. *Vet. Rec.* **176**, 457–460.
- McGreevy, P. and McLean, M. (2010) *Equitation Science*, Wiley-Blackwell, Oxon.
- Nienhaus, A., Skudlik, C. and Seidler, A. (2005) Work-related accidents and occupational diseases in veterinarians and their staff. *Int. Arch. Occup. Environ. Health* **78**, 230–238.
- Parkin, T.D.H., Brown, J. and MacDonald, E.B. (2018) Occupational risks of working with horses: a questionnaire survey of equine veterinary surgeons. *Equine Vet. Educ.* **30**, 200–205.
- Pearson, G. (2017) *Equine Learning Theory and the Horse-Veterinarian Interaction*, Master of Science by Research. , University of Edinburgh
- Reijula, K., Räsänen, K., Hämäläinen, M., Juntunen, K., Lindbohm, M.L., Taskinen, H., Bergbom, B. and Rinta-Jouppi, M. (2003) Work environment and occupational health of Finnish veterinarians. *Am. J. Indust. Med.* **44**, 46–57.
- Stafford, K.J. and Erceg, V.H. (2007) Teaching animal handling to veterinary students at Massey University, New Zealand. *J. Vet. Med. Educ.* **34**, 583–585.
- Stembert, F.B., Lipman, L.J.A. and Loomans, J.B.A. (2003) Dierenarts: een gezond beroep? *Tijdschr. Diergeneesk.* **128**, 566–569.
- Warren-Smith, A.K. and McGreevy, P.D. (2008) Equestrian coaches' understanding and application of learning theory in horse training. *Anthrozoos* **21**, 153–162.
- Wentworth-Stanley, C. (2013) *Survey of Canadian Certified Coaches' Understanding and Application of Learning Theory in Horse Training*. MSc in Equine Science, University of Edinburgh.

Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Supplementary Item 1. The questionnaire distributed amongst equine veterinarians within the UK, including results from those included in the final analysis.

Supplementary Item 2. The methodology used to determine the prevalence of unwanted behaviours.